CLAIM AMENDMENTS

1 through 4 (canceled)

5. (New) A method for producing a hydrocarbon mixture rich in propylene, consisting essentially of propylene, ethylene and other light hydrocarbons from a liquid charge stream containing C_4 to C_8 olefins, which comprises the steps of:

(a) charging the liquid charge stream containing C_4 to C_8 hydrocarbons into an evaporator at a temperature of 25 to 200 ° C to evaporate the liquid stream;

(b) superheating the evaporated liquid stream at a temperature of 350 to 400 ° C followed by an additional superheating of the evaporated liquid stream to 450 to 550 ° C using hot water vapor; to form an olefin - water vapor mixture;

(c) adiabatically reacting the olefin-water vapor mixture, superheated according to step (b), over a shape-selective, pentasil zeolite fixed-bed catalyst to convert a majority of the C_4 to C_8 olefins in the olefin-water vapor mixture to a mixture of C_3 to C_6 olefins rich in propylene;

(d) following step (c), cooling the olefin-water vapor mixture to a temperature of 100 to 200 ° C;

(e) quenching the olefin-water vapor mixture cooled according to step (d), to a temperature of 40 to < 100 ° C, to partially condense the olefin-water vapor mixture; thereby obtaining a gaseous hydrocarbon phase consisting essentially of ethylene, propylene, C_4 to C_8 olefins and additional hydrocarbons and, a liquid phase consisting essentially of water that is returned to the evaporated liquid stream during step (b);

(f) compressing the gaseous hydrocarbon phase obtained according to step (e) at a pressure of 20 to 30 bar absolute to remove accumulated water from the gaseous hydrocarbon phase to obtain a mixture of gaseous and liquid hydrocarbon phases;

(g) separating the mixture of gaseous and liquid hydrocarbon phases into a gaseous hydrocarbon phase, rich in propylene, consisting essentially of propylene, ethylene, and other light hydrocarbons, and recovering said gaseous hydrocarbon phase , and a liquid hydrocarbon phase containing C_4+ olefins; and

(h) separating the liquid hydrocarbon phase into a fraction containing C_4 to C_6 olefins and a fraction containing C_7+ olefins.

6. (New) The method defined in claim 5, wherein according to step (e) the liquid phase consisting essentially of water accumulated as a condensate during the quenching is re-evaporated, then heated to a temperature of 600 to 800 ° C, and then returned to the liquid evaporated stream during step (b).

7. (New) The method defined in claim 5, wherein following step (h) the majority of the generated C_4 to C_6 olefins is returned to the liquid charge stream according to step (a).

8. (New) The method defined in claim 5, wherein according to step (f) the accumulated water, separated from the gaseous and liquid hydrocarbon phases is evaporated, then heated to a temperature of 600 to 800° C, and returned to the liquid evaporated stream during step (b).

9. (New) The method defined in claim 5 wherein according to step (g) the gaseous hydrocarbon phase, rich in propylene consists essentially of 75% propylene.